

COMBATING SEA LEVEL RISE: A POLICY PROPOSAL TO IMPROVE INSTALLATION
RESILIENCE AND MILITARY READINESS

by
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ABSTRACT

The Department of Defense manages one of the world's largest real estate portfolios, maintaining 1,200 installations in the U.S. to support its mission of deterring conflict and protecting national security. Safeguarding these installations is critical to mission assurance, yet Congress and the Department of Defense face an immense challenge in protecting coastal installations from impacts of sea level rise, a consequence of climate change projected to continue at an accelerating rate over the next century. Sea level rise will continue to cause installation damage through more frequent and extensive tidal flooding, intensifying storm surge flooding, and land loss due to permanent inundation. Two-thirds of mission-essential installations in the U.S. are vulnerable to this threat currently or in the future with the potential for billions of dollars required for infrastructure repair and replacement. This policy proposal offers that using consistent sea level rise projections and subsequent installation realignment, closure, or adaptation will prevent damage to military installations in the U.S. and its territories, protecting defense budgets and military readiness.

TABLE OF CONTENTS

Action-Forcing Event.....	1
Statement of the Problem.....	1
History/Background.....	9
Policy Proposal.....	17
Policy Analysis.....	24
Political Analysis.....	38
Recommendation.....	49
Curriculum Vitae.....	52

LIST OF FIGURES

Figure 1. Land Loss across Bases.....	4
Figure 2. Installation Sea Level Rise Vulnerability – The Importance of Place.....	6
Figure 3. U.S. Public View of Current Effects of Climate Change, by Party.....	10
Figure 4. BRAC Acreage Disposed of and Not Yet Disposed.....	32
Figure 5. Percentage of Adults Who View Climate Change as a Policy Priority.....	39
Figure 6. Relative Sea-Level Change Trends & Military Installations in Coastal Congressional Districts.....	45
Figure 7. Virginia Constituents - Should Congress Do More on Climate Change.....	47

Memorandum for Senator Tim Kaine, Ranking Member of the Senate Armed Services Subcommittee on Readiness and Management Support (D-VA)
From: Sarah Chapell
Date: December 12, 2019

Action-Forcing Event

On April 16, 2019, Senator Elizabeth Warren of the Senate Armed Services Committee (SASC) sent a letter to General Joseph Dunford (USMC), Chairman of the Joint Chiefs of Staff, summarizing responses of senior Department of Defense officials when addressing climate change's impact on military missions, installations, and readiness during numerous SASC hearings; none of the officials denied its harmful impact. The letter requested the Department provide a comprehensive report on its actions to date to address the impact of climate change and concluded that the Department must decisively act to mitigate this threat.¹

Statement of the Problem

Over thirty senior military officials, to include Former Secretary of Defense Jim Mattis, have in the past two years publicly labeled climate change as a "threat multiplier" for the United States in the current global security environment.² Tangible effects of climate change, primarily impacts due to sea level rise, are present-day realities facing the Department of Defense and its major assets; this includes more than

¹ Office of Senator Elizabeth Warren, Press Release, "Senator Warren's SASC Hearing Questions Reveal Unanimity of Military Leaders on Climate Change as a Threat to Readiness," last modified April 16, 2019, <https://www.warren.senate.gov/newsroom/press-releases/senator-warrens-sasc-hearing-questions-reveal-unanimity-of-military-leaders-on-climate-change-as-a-threat-to-readiness>.

² Franceso Femio and Caitlin Werrell, "UPDATE: Chronology of U.S. Military Statements and Actions on Climate Change and Security: Jan 2017-August 2019," *The Center for Climate and Security*, last modified August 22, 2019, <https://climateandsecurity.org/2019/08/22/update-chronology-of-u-s-military-statements-and-actions-on-climate-change-and-security-jan-2017-august-2019/>.

1200 military installations in the U.S. that directly support force readiness, operations, and training; these include shipyards, airfields, training grounds, research facilities, family housing, and intelligence centers.³ A core mission of the DOD is to assess security risks and prepare rapid and effective military responses to those threats. Despite this mission and the potential for billions of dollars lost due to permanently inundated infrastructure, the direct implications of sea-level rise on installations are not fully integrated into DOD threat assessments and planning.⁴

Worldwide recurrent flooding has increased in frequency by 300-900% over the last 50 years, and this trend is projected to accelerate over the next hundred years resulting from increasingly more frequent and severe weather events in the United States and abroad.⁵ Additionally, this recurrent flooding will become permanent for some lands, especially in coastal areas, due to global sea-level rise. Twenty-three out of the last twenty-five years, the global mean sea level surpassed the previous year (at an average of 3 millimeters per year but accelerating), with the last seven years consecutively breaking its own record.⁶ These factors could cause severe DoD property and landmass losses, conditions that would damage military readiness and inhibit mission-focused budget execution on both a regional and global level.

³ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 1 <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>.

⁴ U.S. Library of Congress, Congressional Research Service, *Military Installations and Sea-Level Rise*, by Margaret Tucker and G. James Herrera, IF11275 (2019), 1.

⁵ Rebecca Lindsey, "Climate Change: Global Sea Level," *National Oceanic and Atmospheric Administration*, last modified September 19, 2019, <https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>.

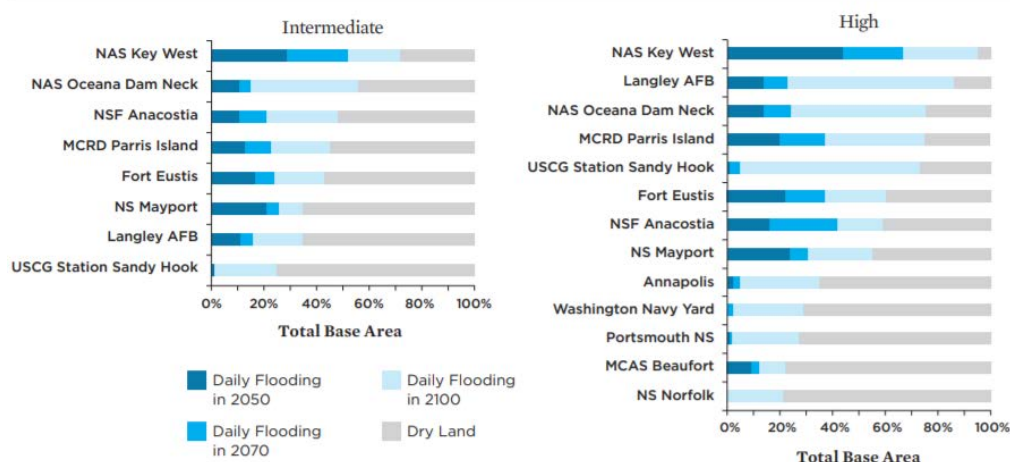
⁶ Ibid.

The United States military responds to governmental and civilian requests for management support related to worldwide security issues through humanitarian assistance, conflict deterrence, and peace stabilization measures as they increasingly are directly triggered or strained by climate change. Sea level rise due to climate change will potentially displace millions of Americans as over 40 percent of the U.S. population lives in a densely populated coastal area.⁷ However, DOD installations store and maintain the armed forces' worldwide supplies and stocks and provide functional bases for national security purposes both domestically and abroad. The Department's capability to effectively respond to issues of national security related to or exacerbated by climate change is debilitated if installations and surrounding critical infrastructure are left vulnerable themselves to the effects of unavoidable sea-level rise. According to the Union of Concerned Scientists, continued sea level rise combined with a lack of mitigation measures will cause (1) more frequent and extensive tidal flooding, (2) land loss as some installation areas are permanently inundated and others flood with daily high tides, and (3) deeper and more extensive flooding due to storm surge.⁸ See figure 1 for the substantial impacts to 13 out of 18 installations from sea level rise found via a recent Union of Concerned Scientists study.

⁷ Rebecca Lindsey, "Climate Change: Global Sea Level," *National Oceanic and Atmospheric Administration*, last modified September 19, 2019, <https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>

⁸ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 2, <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>.

Most of the 18 Installations Studied Risk Major Land Loss



Above are the 13 (out of 18) military installations that are projected to experience a 20% or greater land loss at some point this century. Some sites face substantial losses under either scenario.

Figure 1. Land Loss across Bases⁹

The DOD holds a large share of the overall real property portfolio of the federal government, with over 585,000 facilities (buildings and structures) within 4,775 sites around the globe, 4261 of which are in the United States and its territories.¹⁰ According to an OMB study sampling 57,000 records from coastal federal facilities (majority of them being DOD-owned), 12,000 structures and facilities would be severely affected or inundated due to six feet of sea level rise scenario with replacement costs of \$62 billion, which would inevitably result in severe cuts to military expenditures and operational readiness.¹¹

⁹ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 5 <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>

¹⁰ U.S. Department of Defense, Office of the Deputy Assistant Secretary of Defense for Infrastructure, *Base Structure Report – Fiscal Year 2018 Baseline* (Washington DC, 2018), <https://www.acq.osd.mil/eie/Downloads/BSI/Base%20Structure%20Report%20FY18.pdf>.

¹¹ Executive Office of the President of the United States, Office of Management and Budget, *Climate Change: The Fiscal Risk Facing the Federal Government* (Washington DC, November 2016), https://obamawhitehouse.archives.gov/sites/default/files/omb/reports/omb_climate_change_fiscal_risk_report.pdf.

Effects of sea level rise are particularly severe for critical bases of U.S. territories in the Pacific, where seawater corrosion will limit supplies of potable drinking water while flooding will damage military technology with military and fiscal value beyond actual material building costs. A \$1 billion critical Air Force radar installation was just constructed in 2017 in the Marshall Islands even though the land will likely be uninhabitable by 2030 due to these major challenges.¹² The Department selected the location of the critical asset without incorporating these risks into decision-making. While the project has a reported lifespan of 25 years, accounting for sea level rise cuts that lifespan in half.

Recurring flooding and rising sea-levels are not merely problems for DOD to plan as future threats; these issues are happening now and demand such attention. Increased severe weather events in recent years have provided a small sample of the issues on the road ahead when it comes to impacts on military bases from storm surge flooding and inundation. See figure 2 for specific examples of critical installation impact and damage due to sea-level rise. The type and severity of damage depends on the elevation of the installation which demonstrates the assorted but widespread potential impacts and the urgent need to assess each installation.

¹² The Associated Press, "Rising seas could threaten \$1 billion Air Force radar site," *CBS News*, last modified October 18, 2016, <https://www.cbsnews.com/news/rising-sea-warnings-air-force-radar-site/>.

	Naval Station Norfolk	Marine Corps Base Camp Pendleton
Mission	Provides fleet support and facilities to ensure readiness for the US Atlantic Fleet	Amphibious assault training center supporting combined air, sea, and ground combat training
Setting	Located in a major metropolitan area of 4300 acres in Hampton Roads area of Virginia at the confluence of the Elizabeth and James Rivers	Primarily natural, undeveloped areas of 125,000 acres along the exposed Southern California coast between Orange County and San Diego
Stressors	Co-occurrence of storm surge, high tides and increasing sea level with heavy precipitation	Co-occurrence of large waves, high tides and increasing sea level
Pathways	Inundation and flooding from elevated sea level, but limited morphologic change	Beach and bluff erosion driven by the combined effect of waves and increasing sea level
Impact	Critical aboveground "built" infrastructure assets such as piers, pylons, distribution lines, and generators	Amphibious training areas, groundwater supply systems, and coastal natural resources

Source: This is a reproduction of a figure from 'Assessing Impacts of Climate Change on Coastal Military Installations: Policy Implications', Strategic Environmental Research and Development Program, 2013, pg 17.

Figure 2. Contrasting Installation Sea Level Rise Vulnerability – The Importance of Place¹³

In September of 2018, storm surges and subsequent rain from Hurricane Florence produced \$3.6 billion in building damage and repair costs at Marine Corps' Camp Lejeune in North Carolina.¹⁴ Another \$4.5 billion is required to cover damages to Tyndall Air Force Base in Florida, which suffered severe damages from Hurricane Michael in October 2018.¹⁵ The Acting Secretary of Defense Patrick Shanahan had to submit a reprogramming request to Congress for the total value of over \$9 billion as these disaster costs are not normally absorbed by DOD.¹⁶ These extreme weather

¹³ Heather Messera and Francesco Femia, *Military Expert Panel Report: Sea Level Rise and the U.S. Military's Mission* (February 2018), The Center for Climate and Security, 22.

¹⁴ Shawn Snow, "\$3.6 billion price tag to rebuild Lejeune buildings damaged by Hurricane Florence" *The Marine Corps Times*, last modified December 12, 2018, <https://www.marinecorpstimes.com/news/your-marine-corps/2018/12/12/36-billion-price-tag-to-rebuild-lejeune-buildings-damaged-by-hurricane-florence/>.

¹⁵ Rachel S. Cohen, "USAF Expects to Need Nearly 1B for Tyndall Recovery in FY19," *Air Force Magazine*, last modified March 13, 2019, <http://www.airforcemag.com/Features/Pages/2019/March%202019/USAF-Expects-to-Need-Nearly-1B-for-Tyndall-Recovery-in-FY19.aspx>.

¹⁶ Aaron Mehta, "Memo: Pentagon delivers reprogramming request, seeks supplement for \$9 billion hurricane damage," *Defense News*, last modified March 25, 2019, <https://www.defensenews.com/smr/federal-budget/2019/03/25/memo-pentagon-delivers-reprogramming-request-seeks-supplemental-for-9-billion-hurricane-damage/>.

events, exacerbated by continued sea level rise and climate change, demonstrate the potential fiscal impact to the Department for unplanned climate events.

The Congressional appropriations process makes it much easier to react to major installation damage instead of adapting infrastructure to endure these occurrences, especially for gradual, long-term sea level rise.¹⁷ Current vulnerabilities to an installations are funded through the Facilities Sustainment, Maintenance, and Restoration (FSRM) account; yet according to Assistant Secretary of Defense for Energy, Installations, and Environment Honorable Lucian Niemeyer, this account is underfunded year after year, with deferred funds totaling \$116 billion going into Fiscal Year 2019.¹⁸ Resilience of critical civilian infrastructure surrounding installations is also a required factor, yet many cities and towns cannot afford sea level rise adaptation costs, which in some areas like Norfolk, Virginia are estimated to cost over \$1 billion, funds that are not readily available.¹⁹ As the impacts of sea level rise accelerate, the Pentagon has not made the responsible fiscal plans and decisions necessary to ensure that funds do not have to be pulled from other activities to cover installation damage from storm flooding or sea level rise, further deteriorating overall military readiness.

¹⁷ Li Zhou, "The disaster aid fight shows how unprepared Congress is to deal with the effects of climate change," *Vox News*, last modified May 16, 2019, <https://www.vox.com/policy-and-politics/2019/5/16/18617697/disaster-aid-senate-puerto-rico-trump-climate-change>.

¹⁸ Lucian Niemeyer, Statement Before the House Committee on Armed Services Subcommittee on Readiness, "Fiscal Year 2019 DoD Budget Request for Energy, Installations, and Environment, April 18, 2018, <https://docs.house.gov/meetings/AS/AS03/20180418/108135/HHRG-115-AS03-Wstate-NiemeyerL-20180418.PDF>.

¹⁹ Nick Sobczyk, "Group aims to 'open up' DoD grants for climate adaptation," *E&E News*, last modified May 7, 2018, <https://www.eenews.net/stories/1060080907>.

Additional challenges U.S. installations face when attempting to address these challenges include Department guidance on the use of climate projections and addressing sea level rise and climate risks to built infrastructure. Out of 23 installations examined in a 2019 study by the Government Accountability Office (GAO), 15 had integrated some considerations of climate change into planning documents and only 2 installations had taken steps to fully assess impacts and address these risks as the Unified Facilities Criteria does not explicitly require a risk assessment specifically for these factors.²⁰ Moreover, only 8 out of the 23 installations used climate projections, with DOD officials stating they “did not have the installation-level climate data from their military departments or from other DOD sources that they would need to understand the potential effects of climate change on their installations” and cited the need for additional DoD guidance on their use.²¹ Retired Rear Admiral Ann Phillips shares these concerns as a board member of the Center on Climate and Security, stating, “The challenge in the installation master planning process is that they still aren’t using predictive flood mapping, they still aren’t looking at what will happen to [installations such as] Naval Station Norfolk beyond 20 years.”²² Without these assessments and data availability, installations could potentially underestimate

²⁰ Government Accountability Office, “DOD Needs to Assess Risk and Provide Guidance on Use of Climate Projections in Installation Master Plans and Facilities Designs,” GAO-19-453 (June 2019), <https://www.gao.gov/assets/700/699679.pdf>.

²¹ Ibid.

²² Nick Sobczyk, “Group aims to ‘open up’ DoD grants for climate adaptation,” *E&E News*, last modified May 7, 2018, <https://www.eenews.net/stories/1060080907>.

potential damage to infrastructure due to accelerating sea level rise, thus insufficiently planning for these risks.

History & Background

While global sea level rise and the larger climate change threat was examined in the 1980s and earlier decades by various academic bodies, the national defense community initiated formal research on the topic in 1990 at the request of The Select Senate Committee on Intelligence (SSCI); this assessment came in the form of a report by the U.S. Navy War College calling for additional analysis and military preparedness.²³ The first explicit mention of climate change in the National Security Strategy was in 1991.²⁴ The Central Intelligence Agency in coordination with The Council on Foreign Relations and Senator Al Gore established an Environmental Task Force (ETF) in 1992 to enable scientists to use government global surveillance records and intelligence capabilities to study climate change, a program that lasted until the early days of the George W. Bush Administration.²⁵ Robert Gates was the Director of Central Intelligence during the ETF establishment and later became the Secretary of Defense from 2006 to 2011.

Throughout the decade and into the early 2000s a plethora of studies on climate change implications on the U.S. military have been released by the intelligence

²³ Francesco Femio and Caitlin Werrell, "Chronology of the U.S. Military and Intelligence Community Concern About Climate Change," *The Center for Climate and Security*, last modified January 12, 2017, <https://climateandsecurity.org/2017/01/12/chronology-of-the-u-s-military-and-intelligence-communitys-concern-about-climate-change/>

²⁴ Ibid.

²⁵ Ibid.

community, the U.S. Congress, military services and schoolhouses, and academia. Nevertheless, throughout the entirety of the George W. Bush Administration climate change risks were not included in the National Security Strategy or any other strategic policies and programs. This passive approach completely shifted from the start of the Obama Administration. There is a dichotomy between the Democratic and Republican parties regarding the validity of the severe impacts from climate change depicted by scientists worldwide. Figure 3 demonstrates that the issue continues to become more politicized over time with an increasingly divided perception of its security risk, adding further challenges to any policy plans for mitigation or adaptation.

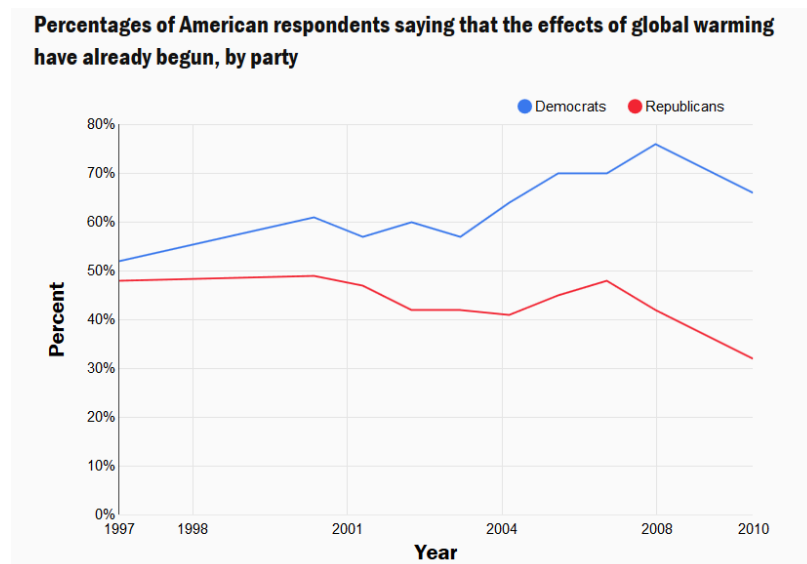


Figure 3. Percentages of American Respondents Saying that the Effects of Global Warming have Already Begun, By Party²⁶

This politicization creates barriers to Congressional or Executive Branch action.

For the Republican Party, admitting to the severity of climate change would

²⁶ Elke E. Weber and Paul C. Stern, "Public Understanding of Climate Change in the United States," *American Psychologist*, (May-June 2011), format retrieved from <https://www.brookings.edu/research/the-challenging-politics-of-climate-change/>.

subsequently call for major regulatory changes regarding the current business practices of American corporations, the Federal Government, and all American households. The party sees this as a direct conflict to its pro-business, small-government values. Moreover, pressure from advocacy coalitions representing the non-renewable energy sector amongst others serve as barriers to change, while conservative media and political figureheads deny the severity of the issue. Therefore, the Bush administration largely avoided confronting the issue. While the Department of Defense continued to conduct studies, it followed suit with the Administration and focused on near-term threats to national security such as the post-9/11 global war on terror and wars in Iraq and Afghanistan.²⁷

For Democrats, the issue is seen as an important one requiring significant action, yet little consensus remains on how to approach mitigation or adaptation requiring major policy changes. The ongoing debates amongst Democratic Party leaders surrounding the Green New Deal's general goals demonstrates this divide.²⁸ Moreover, the American public for the past few decades until today does not view this as a top policy priority compared to health care, jobs, and the economy.²⁹ However, the transition to the Obama Administration served as an opportunity to identify the severity of climate change within the intelligence and defense communities. President Obama's

²⁷ Gary L. Gregg II, "George W. Bush: Foreign Affairs," *The Miller Center, University of Virginia*, 2019, <https://millercenter.org/president/gwbush/foreign-affairs>.

²⁸ Benjy Sarlin, "What is the 'Green New Deal' and How Would it Work?" *NBC News*, last modified September 18, 2018, <https://www.nbcnews.com/politics/2020-election/green-new-deal-how-it-works-presidential-candidate-positions-n1044811>

²⁹ Elaine Kamarck, "The Challenging Politics of Climate Change," *The Brookings Institution*, last modified September 23, 2019, <https://www.brookings.edu/research/the-challenging-politics-of-climate-change/>

first National Security Strategy released in 2010 explicitly states “danger from climate change is real, urgent, and severe.”³⁰ Climate change was subsequently included in Department of Defense strategic guidance.

The 2010 Quadrennial Defense Review (QDR) Report was the first time the Department identified climate change as a risk to military operations and installations, under the leadership of Defense Secretary Robert Gates. The QDR cites climate change as one of four priority areas for department reform, as it states, “DoD will need to adjust to the impacts of climate change on our facilities and military capabilities” and goes on to explain, “In 2008, the National Intelligence Council judged that more than 30 U.S. military installations were already facing elevated levels of risk from rising sea levels. DoD’s operational readiness hinges on continued access to land, air, and sea training and test space. Consequently, the Department must complete a comprehensive assessment of all installations to assess the potential impacts of climate change on its missions and adapt as required.”³¹

Albeit a few years after the QDR, the Department released two documents that would prove momentous in setting up a framework to incorporate the risk of sea-level rise and climate change as part of its overall risk assessment and adaptation mission. These efforts were initiated by Executive Orders issued by President Obama. The first EO released in 2009 titled *Focused on Federal Leadership in Environmental, Energy, and*

³⁰ The White House and Barack Obama, *National Security Strategy of the United States*, (Washington DC, 2010) <http://nssarchive.us/NSSR/2010.pdf>

³¹ U.S. Department of Defense, *Quadrennial Defense Review Report*, (Washington DC, February 2010), https://dod.defense.gov/Portals/1/features/defenseReviews/QDR/QDR_as_of_29JAN10_1600.pdf

Economic Performance mandated all federal agencies to develop sustainability performance plans. And the second EO in 2013 called *Preparing the United States for the Impacts of Climate Change* directed federal agencies to provide the White House an assessment of necessary changes to land- and water-related policies, regulations, and programs that would improve climate resiliency.³² The first Department effort was the FY2012 and an improved FY2014 Climate Change Adaption Roadmap, a document which identifies several ways that climate change impacts the emerging security environment and prescribes broad measures the Department can pursue to address these challenges.³³ These goals largely build upon and directly cite those identified in the 2010 QDR and assigns the Deputy Undersecretary of Defense for Installations and Environment as the primary climate change adaptation planning official for the Department. Although the Department has not fully implemented most of the outlined measures, has not met intended goals, or provided an update to this Roadmap to date, it still serves as a useful document outlining the significant scope of actions required from the Department.

The second significant effort aligned with the 2013 EO was a Department of Defense Directive entitled *Climate Change Adaptation and Resilience* that assigns roles and responsibilities among DoD organizational entities and defense agencies regarding

³² The White House and Barack Obama, *Executive Order 13653 Preparing the United States for the Impacts of Climate Change*, <https://obamawhitehouse.archives.gov/the-press-office/2013/11/01/executive-order-prEPAring-united-states-impacts-climate-change>

³³ U.S. Department of Defense, Office of the Secretary of Defense, *DoD FY14 Climate Change Adaptation Roadmap*, (Washington, DC 2014), https://www.acq.osd.mil/eie/downloads/CCARprint_wForward_e.pdf

climate change.³⁴ It assigns the same primary adaptation official (now called the Assistant Secretary of Defense for Energy, Installations, and Environment) along with additional duties to incorporate climate change adaptation and resiliency in the installation planning and basing process and advise the Unified Facilities Criteria Program to set appropriate military construction standards.³⁵

With the transition to a new Republican Administration in 2017, however, many of the Obama Administration efforts were rolled back. Obama's climate change executive order along with several other key Obama Administration climate change directives were rescinded by President Trump in March 2017 through his Executive Order on *Promoting Energy Independence and Economic Growth*.³⁶ The Department developed much of its climate change guidance to fulfill Obama era requirements and these documents are still in existence today. New strategic guidance addressing climate change risk is clearly absent from the 2017 National Security Strategy and 2018 National Defense Strategy.³⁷

Despite the strong Trump Administration aversion to climate change action and guidance to federal agencies, the U.S. Congress has been able to use the annual National Defense Authorization Act (NDAA) as a means to mandate the Department of

³⁴ U.S. Department of Defense, Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics, *DoD Directive 4715.21 Climate Change Adaptation and Resilience*, (Washington DC, January 14 2016), <https://dod.defense.gov/Portals/1/Documents/pubs/471521p.pdf>

³⁵ Ibid.

³⁶ The White House and Donald Trump, *Executive Order 13868 Promoting Energy Independence and Economic Growth*, (Washington DC March 28 2017), <https://www.whitehouse.gov/presidential-actions/presidential-executive-order-promoting-energy-independence-economic-growth/>

³⁷ Benjamin Haas and Mark Nevitt, "Two Notable Omissions in the Mattis National Defense Strategy," *American Security Project*, last modified January 26, 2019, <https://www.americansecurityproject.org/two-notable-omissions-in-the-mattis-national-defense-strategy/>.

Defense to improve sea level rise risk assessments and specific adaptation efforts. The FY18 NDAA required the DoD to produce a report on the comprehensive effects of climate change as well as a prioritized list of the most vulnerable installations. The former task resulted in the 2019 DoD *Report on Effects of a Changing Climate*, which states:

Vulnerabilities to installations include coastal and riverine flooding. Coastal flooding may result from storm surge during severe weather events. Over time, gradual sea level changes magnify the impacts of storm surge, and may eventually result in permanent inundation of property. Increasing coverage of land from nuisance flooding during high tides, also called “sunny day” flooding, is already affecting many coastal communities.³⁸

The Department also partially fulfilled the latter requirement in January 2019 by providing a report on the installations most vulnerable to climate change. The report did not rank the list of installations until an April 2019 addendum was added due to Congressional dissatisfaction with the initial report.³⁹ It additionally excluded U.S. Marine Corps installations and all installations outside of the Continental United States, an omission of likely many sites highly vulnerable to sea-level rise.⁴⁰ Moreover, this assessment only focused on current risks from climate change without incorporating

³⁸ U.S. Department of Defense, *Report on Effects of a Changing Climate to the Department of Defense*, (Washington DC, January 2019), page 10, <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF>

³⁹ Paulina Glass, “Lawmakers Tell Pentagon: Revise and Resubmit Your Climate-Change Report,” *Defense One*, last modified February 5, 2019, <https://www.defenseone.com/threats/2019/02/lawmakers-tell-pentagon-revise-and-resubmit-your-climate-change-report/154657/>.

⁴⁰ Ibid.

future risks with climate projections. Yet even in this preliminary survey the Department found that two-thirds (or, approximately 66%) of the 79 installations addressed in the report are vulnerable to current or future recurrent flooding.⁴¹

The FY19 NDAA incorporated additional requirements to the Department for installation readiness, including mitigation plans for new military construction projects within the 100-year floodplain and including climate considerations in installation master plans and design requirements via Unified Facilities Criteria.⁴² While these are important steps forward for the Department, they only address new construction plans and not the thousands of existing installations. Additionally, as a June 2019 GAO report identifies, the Department not only inconsistently includes climate change considerations in installation planning, design, and maintenance but also does not optimize its use of accurate climate projections to assess future climate risks as there are no specific requirements to do so.⁴³

Senator Elizabeth Warren’s proposed *Climate Resiliency and Readiness Act*, introduced in May 2019, was a sweeping proposal to provide dedicated funding for DoD climate resiliency efforts, would require Defense contractors to identify their own climate-related risks as they directly affect the defense industrial base and DoD supply

⁴¹U.S. Department of Defense, *Report on Effects of a Changing Climate to the Department of Defense*, (Washington DC, January 2019), page 10, <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF>

⁴² John Conger, “U.S. Congress Addresses Climate Change and Security in Latest Defense Bill,” *The Center for Climate and Security*, last modified August 13, 2018, <https://climateandsecurity.org/2018/08/13/u-s-congress-addresses-climate-change-and-security-in-the-latest-defense-bill/>.

⁴³ Government Accountability Office, “DOD Needs to Assess Risk and Provide Guidance on Use of Climate Projections in Installation Master Plans and Facilities Designs,” GAO-19-453 (June 2019), <https://www.gao.gov/assets/700/699679.pdf>.

chain.⁴⁴ Senator Warren proposed a very similar requirement in her 2018 *Climate Risk Disclosure Act*.⁴⁵ This Act would also require the Department to create a climate vulnerability risk assessment tool and incorporate climate considerations in future base realignment and closure activities as well as strategic guidance.⁴⁶ Neither piece of legislation was passed.

In 2019, while the Department of Defense has been partially successful in improving its resiliency to the threat of sea-level rise and wider climate change impacts, major vulnerabilities and policy gaps still remain. The national security community largely sees this as a problem, although disagree on its level of importance compared to adversaries and near-peer threats like Russian and Chinese aggression.⁴⁷ The Department continues to toe the line of strong politicization of the issue of climate change while climate projections and the Department's own assessments continue to demonstrate sea level rise is a significant risk to fixed installations in the U.S. and its territories.

Policy Proposal

The goals of this policy are to assess 100% of military installations in the U.S. and its territories for long-term sea level rise vulnerabilities and that by 2030, zero assessed

⁴⁴ Office of Senator Elizabeth Warren, Press Release, "Warren, Escobar Announce Legislation to Require Dept. of Defense to Adapt to Climate Change Threat," last modified May 15, 2019, <https://www.warren.senate.gov/newsroom/press-releases/warren-escobar-announce-legislation-to-require-dept-of-defense-to-adapt-to-climate-change-threat>.

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Benjamin J. Hulac, "Democrats want to require Pentagon to study climate change risks on military bases," *Roll Call*, last modified June 6, 2019, <https://www.rollcall.com/news/congress/ndaa-amendment-part-effort-push-pentagon-climate>.

installations will have land loss of 20% or greater projected for year 2050. This policy will reduce the Department's risk of diminished military readiness and fiscal exposure from sea level rise through the comprehensive integration of sea level rise projections into all military master installation plans, individual facility projects, and critical supporting civilian infrastructure in U.S. states and territories by 2024 and the implementation of a full Base Realignment and Closure (BRAC) round and installation adaptation measures by 2030 to address installations with 20% or greater projected land loss. The *Rising Tides Defense Resiliency and Readiness Act* will enable the use of vetted climate projections across small, intermediate, and major fixed installations will ensure the accurate identification of those installations with the most mission-critical need of resiliency modifications for long-term planning and budgeting prioritization. A BRAC round would serve as the mechanism to address fixed installations where modifications would be too costly or impractical while funding adaption projects would be pursued for the rest of the Department's overall high-risk real estate portfolio.

Policy Authorization Tool:

Further climate resiliency should be amended in the FY2020 National Defense Authorization Act (NDAA), which will serve as the authorization tool of this policy. The NDAA is the mechanism used by historical precedent and the general legislative process to authorize the budget and expenditures of the Department of Defense through the Senate and House Armed Services Committees. The FY2020 bill supports \$750 billion

worth of national security programs.⁴⁸ This bill sets the guideline and limitation to defense appropriations bills for the House and Senate Appropriations Committees, authorizing specific funding ceilings. The NDAA affects many aspects of Department of Defense programs anywhere between military construction to equipment procurement, military aid, personnel training, nuclear programs, and beyond. The NDAA can affect many different sections of law (Title 10, 32, 22, 31 etc.) as the Department of Defense operates worldwide and with several federal agencies for complex and widespread missions. Additionally, the NDAA has been passed every year since 1961 with few exceptions as a practical and symbolic demonstration of bipartisanship due to its importance for national security.⁴⁹ Due to its broad scope of influence on the Department of Defense to include research and development, military construction, base realignment and closure, and funding authorizations, it is the most effective mechanism to address the described issues.

Policy Implementation Tool:

The provisions of the *Rising Tides Defense Resiliency and Readiness Act* are five-fold: the development and required use of a sea level rise vulnerability and assessment tool; the incorporation of the assessed risk in DoD strategic guidance and the Mission Assurance Construct; the authorization of a new round of Base Realignment and Closure using sea level rise vulnerability criteria; a dedicated budget line item for sea level rise

⁴⁸ United States Senate Armed Services Committee, Press Release, "SASC Chairman, Ranking Member Praise Senate Passage of National Defense Authorization Act," last modified June 27, 2019, <https://www.armed-services.senate.gov/press-releases/sasc-chairman-ranking-member-praise-senate-passage-of-national-defense-authorization-act>.

⁴⁹ Ibid.

adaption and mitigation project costs; and DoD funding authorization for cost-sharing with state and local governments for adaptation and mitigation projects of civilian infrastructure critical to supporting DOD installations.

- 1) The development of a DoD-wide sea level rise vulnerability and assessment tool and its required use.

Based on Senator Warren's *Defense Climate Resiliency Readiness Act*, this sea level rise projection tool will be vetted and authorized for use by relevant Department installation planners and engineers.⁵⁰ This modification of Title 10 USC section 2864 and section 2802 shifts from requiring the use of any projection tool for master plans and projects of major installations, to a standard DoD tool to be used.⁵¹⁵² In addition to Warren's bill, this policy will specify the tool will be used to assess the risk to existing or new project for its lifespan and will be required for intermediate and small installations as well (sites with a Plant Replacement Value (PRV) less than \$2.067 billion).⁵³ The Department of Defense will develop this tool and research and development will be authorized for two years in consultation with the National Oceanic and Atmospheric Administration, the Administrator of the Federal Emergency Management Agency, the Army Corps of Engineers, Naval Facilities Engineering Command, and the Strategic Environmental Research and Development Program. This tool will cost approximately \$890,000 based

⁵⁰ Senator Elizabeth Warren and Rep. Veronica Escobar, *The Department of Defense Climate Resiliency and Readiness Act*, May 15 2019, <https://www.warren.senate.gov/imo/media/doc/Warren-DoDClimateResiliencyandReadinessAct%20Section-by-Section%20Summary.pdf>.

⁵¹ Title 10 USC 2864, Chapter 169, Section 2864, Master Plans for Major Military Installations.

⁵² Title 10 USC, Chapter 169, Section 2802, Military Construction Projects.

⁵³ Margaret Tucker and G. James Herrera, "Military Installations and Sea Level Rise," *Congressional Research Service*, July 26, 2019, <https://fas.org/sgp/crs/natsec/IF11275.pdf>.

on costs for a similar two-year project of the Northeast Regional Association of Coastal and Ocean Observing Systems, and will be funded through DoD base budget appropriations.⁵⁴ The U.S. Army Corps of Engineers, Naval Facilities Engineering Command, and the Air Force Civil Engineer Center will be responsible for administering and updating the Unified Facilities Criteria to implement the incorporation of this tool into project standards.

- 2) The required incorporation of the threat of sea level rise to DoD critical assets into the National Defense Strategy and National Military Strategy, and the posture statements of Military Departments provided to Congress.

This requirement is based on Senator Warren’s *Defense Climate Resiliency Readiness Act*. The NDS is released approximately every four years, with the next expected for 2022.⁵⁵ Not described in Warren’s bill is that those risks identified in the NDS, NMS, and other DoD strategy documents provide the framework of risks to assess for the DoD Mission Assurance Construct, which provides comprehensive risk management to defense critical assets and integrates objectives into DoD strategic guidance, plans, and policies.⁵⁶ There are no direct costs associated with this action, although it would indirectly influence broad DoD programming and budgeting in future years.

⁵⁴National Oceanic and Atmospheric Administration, Office for Coastal Management, “Coastal Resilience Grant Program Project Summaries: High Resolution Coastal Inundation Modeling and Advancement of Green Infrastructure and Living Shoreline Approaches in the Northeast (2016), last modified May 23, 2019. <https://www.coast.noaa.gov/resilience-grant/projects/>.

⁵⁵ Aaron Mehta, “The Pentagon’s National Military Strategy is Done, and it’s Unclear if the Public Will Ever See It,” *Defense News*, February 13, 2019, <https://www.defensenews.com/pentagon/2019/02/13/the-pentagons-national-military-strategy-is-done-and-its-unclear-if-the-public-will-ever-see-it/>

⁵⁶ Department of Defense, *Mission Assurance Construct*, Department of Defense Instruction 3020.45 (Washington DC, August 2018), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/302045p.pdf?ver=2018-08-14-081232-450>.

3) Authorize a new round of Base Realignment and Closure (BRAC).

Adopted from then-SASC Chairman McCain and Ranking Member Reed's proposed amendment to the FY18 NDAA, a new BRAC round would be authorized with changes to its statute, 10 USC section 2687. This includes a \$5 billion cap on the implementation costs, and the removal of the independent commission charged with reviewing recommendations from DoD to Congress.⁵⁷ This calls for DoD to provide recommendations directly to Congress, with the Government Accountability Office validating DoD data.⁵⁸ A modification of the original McCain-Reed proposal would explicitly add sea level rise to the judgment criteria, as the 2005 BRAC round only included the criteria related to this issue to include "(3) The ability of the infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel. (4) The environmental impact, including the impact of costs related to potential environmental restoration, waste management, and environmental compliance activities."⁵⁹ The first step after BRAC authorization is for DoD to conduct an extensive study on its bases with the outlined criteria, to include an inventory of all DoD real estate and incorporating a 20-year force structure plan, the duration of which could be up to four years. After recommendation approval, DoD has six years to implement changes.⁶⁰

⁵⁷ Joe Gould, "DoD backs McCain-Reed Proposal to Close Military Bases," *Defense News*, last modified September 5, 2017, <https://www.defensenews.com/congress/2017/09/05/dod-supports-mccain-reed-base-closure-proposal/>.

⁵⁸ Ibid.

⁵⁹ Congressional Research Service, "Base Realignment and Closure (BRAC): Background and Issues for Congress." *CRS Report R45705*, last modified April 25, 2019, <https://fas.org/sgp/crs/natsec/R45705.pdf>.

⁶⁰ Ibid.

- 4) A dedicated budget line item within the annual Department of Defense Budget Request for costs of sea level rise adaptation and mitigation to military installations, facilities, and their assets and capabilities.

Adopted from Senator Warren's *Defense Climate Resiliency Readiness Act* but modified specifically for sea-level rise, the DoD budget request would use sea level rise projections and strategic governance process in sections 1 and 2 to inform this decision-making. This requirement would be instated for the FY2021 budget cycle. A requirement to use climate projections in this budgeting would not be included in this NDAA as the required sea level rise vulnerability and assessment tool would not be fully operational until approximately two years later. Nevertheless, as installation planners assess their installation requirements in the present defense budgeting process, there should be a dedicated line item for these modification costs for DoD and Congressional stakeholders to incorporate steady funds for these projects.

- 5) The authorization of funds for a DoD cost-sharing mechanism for sea level rise adaptation and mitigation projects for local and state-owned community infrastructure critical to supporting DoD installations.

Infrastructure surrounding a military installation owned by state and local government entities may still be critical to the support of the installation and therefore should be included in the risks assessment of sea-level impacts. The Defense Community Infrastructure Program (DCIP) within Title 10 of Section 2391 should be authorized for \$100 million through DoD's Office of Economic Adjustment to provide grants to state and local governments for community infrastructure projects of other federal agencies

for the same purpose. This authorization funding figure is based off of a request letter led by Representative Elaine G. Luria (2nd District, Virginia) to the Chairman of the SASC by members of the HASC and SASC that represent districts or states requiring these infrastructure projects.⁶¹ Section 2803 of the Senate version of the FY20 NDAA specify that assessing resiliency risks and threats to military installations must include community infrastructure projects and this should be included language in the DCIP statute. The current law requires the grant-receiving government to contribute 30% of each project cost which can be waived for national security purposes as necessary and this policy will maintain that percentage.⁶²

The 2024 timeline for conducting vulnerability assessments for all military installations in the U.S. and its territories is based on the two year estimate to develop a standard DoD sea level rise projection tool, another two years for its full inclusion in installation master plans and individual projects as well as defense keystone strategy and planning documents. The complete implementation of the policy by 2030 is based on the estimated total of 10 years to complete a BRAC round and a 10-year funding timeline for adaptation measures.

Policy Analysis

This proposal calls for significant changes to the National Defense Authorization Act for Fiscal Year 2020 as it relates to climate projection technology, military construction,

⁶¹ Representative Elaine G. Luria, Letter to The Honorable James Inhofe, Chairman of the Senate Armed Services Committee, September 23, 2019, https://luria.house.gov/sites/luria.house.gov/files/wysiwyg_uploaded/2019.09.23%20-%20Letter%20to%20NDAA%20Conferees%20on%20DCIP.pdf.

⁶² Title 10 USC, Chapter 169, Section 2802, Military Base Reuse Studies and Community Planning Assistance.

strategic defense guidance, risk assessments, and budgeting to address the threat of sea level rise to coastal U.S. military installations. The purpose of the proposed legislative changes are to assess 100% of military installations in the U.S. and its territories for long-term sea level rise vulnerabilities and that by 2030, zero assessed installations will have land loss of 20% or greater projected for year 2050. The policy analysis is based on the assumption that subsidence of coastal areas and accelerated sea level rise will continue throughout the 21st century based on current climate projections, causing partial or complete inundation of land and its infrastructure on U.S. coastlines. The extent of impact is dependent on the geographic area of the installation's coastline, the projected elevation above sea level of coastal lands, and the current infrastructure to address flooding or increased sea level at each site; however, based on preliminary assessments to include a 2018 Union of Concerned Scientists 18-installation study, some installations are projected experience 20% or greater land loss by 2050. Proposed climate projections would have the assumed capability to identify impacts of sea level rise up to year 2100. This analysis additionally assumes the Department of Defense would fully implement the described policy provisions.

i. Installation Sea Level Rise Vulnerability Assessments

The technical feasibility of developing a DoD climate projection tool based on current data is robust, as other federal tools already exist and are currently authorized in the FY19 NDAA for use by large installations to include those from the U.S. Geological Survey, U.S. Global Change Research Office, the National Climate Assessment, and the

National Academies of Science.⁶³ Developing a DOD-wide projection tool would standardize the data used to assess installation vulnerabilities, ensuring uniform and accurate data. The size of an installation does not always equate to military value, as seen through the aforementioned small site with a \$1 billion critical satellite system in the Pacific facing permanent inundation. The proposal calls for this tool's use not only at large installations, but small and medium installations as well in order to achieve 100% installation assessment. The cost of development is estimated at \$890,000 with additional onsite-training at installations likely producing additional labor costs. This price, however, is relatively affordable within the larger annual defense budget and the potential cost of installation damage due to the unavailability of accurate projections. When compared to the long-term plant replacement value of these installations due to sea level rise likely to surpass one billion dollars, the tool's cost would provide an exponential return. This technology development would enable access to a sea level rise assessment tool to installations that previously did not have the resources available for its utilization or an actual requirement for its use. Optimizing the accessibility of this data to all DoD installations enhances DoD technological capabilities and its equity.

Nevertheless, DoD can only use currently available scientific research to establish a sea level rise projection tool and modify installations accordingly. Although it is clear that rising sea levels is a current reality, it will accelerate over the next century, and technological feasibility of projections exist, the exact sea level increases in these

⁶³Rep. Mac Thornberry, *H.R.5515 John S. McCain National Defense Authorization Act for Fiscal Year 2019*, August, 13, 3018, page 132, stat. 2263, <https://www.congress.gov/bill/115th-congress/house-bill/5515/text>.

projections are in fact estimates with the certainty of the assessment reducing with each succeeding decade. The uncertainty of the rate and extremity of sea level rise leaves gaps in projection certainty that could lead to poor or incorrect decisions about the future vulnerabilities. Therefore, while technical feasibility exists to produce necessary projections, DoD officials and Congressional legislators must accept the risk to policy implications from a level uncertainty in these projections as they project into future decades.

Additionally, since consultation with science and weather-based federal agencies is required to develop a projection tool, it would be more efficient to instead create a single assessment tool for the entire federal government, a responsibility beyond the Department of Defense and the authorization tool (the NDAA) chosen for this policy. As aforementioned, there are currently several sea level rise projection tools of the federal government. Pooling federal resources, capabilities, and expertise through an interagency effort instead would optimize the tool's effectiveness in producing accurate projections and reduce redundant efforts of climate assessment, saving time and money for all agencies involved. In short, the proposed DoD assessment tool does not achieve optimum efficiencies.

Incorporating sea level rise into the DoD Mission Assurance Construct is a comprehensive mechanism for prioritizing and resourcing to protect critical infrastructure across the Department. The Mission Assurance Construct used by the Department is defined as, "A process to protect or ensure the continued function and resilience of capabilities and assets, including personnel, equipment, facilities, networks,

information and information systems, infrastructure, and supply chains, critical to the execution of DoD mission-essential functions in any operating environment or condition.”⁶⁴ Since sea-level rise will harm as many as two-thirds of installations and their assets within the U.S. and its territories, the Mission Assurance Construct is appropriate process for assessing the risk to core missions based on sea level rise projections. Risk-informed decisions can be made regarding the prioritization of sea level rise installation adaptation requirements, therefore this would optimize the effectiveness in achieving the stated assessment goal of this policy.

Part of the Department’s mission is assessing threats and responding to those threats rapidly, such as violence in the Middle East or disaster relief after an extreme weather event. The National Security Strategy, National Defense Strategy, and National Military Strategy direct the scope of long-term risks to be addressed in DoD planning and budgeting. In April 2015, DoD released its Cyber Strategy where it announced cyber security would be included in the Mission Assurance Program and update relevant policy.⁶⁵ As seen through this significant strategic shift, the Department has the administrative capacity to add additional factors to the Mission Assurance program that have widespread implications for the Department.

While the threat of sea level rise could likely be added to the next set of these strategic documents with the Department’s extensive administrative capacity, the policy

⁶⁴ U.S. Department of Defense, Directive 3020.40, *Mission Assurance*, (Washington DC, November 2016), page 18, https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/302040_dodd_2016.pdf

⁶⁵ U.S. Department of Defense, *The DoD Cyber Strategy*, (Washington DC, April 2015), page 21, https://archive.defense.gov/home/features/2015/0415_cyber-strategy/final_2015_dod_cyber_strategy_for_web.pdf

and governance shifts of the Department based on this guidance can take several years to implement based on past implementation timelines. For example, changing policies such as DoD Directive 3020.40 *Mission Assurance* in accordance with these strategic documents requires subsequent incorporation into Service-level guidance. When the Department updated the DoD Directive on Installation Energy Management in March 2016 to expand energy resilience and critical energy infrastructure requirements, it took until February 2017, nearly a year later, to include this guidance in Army guidance for subsequent implementation by Army installations.⁶⁶ While this demonstrates that incorporating environmental engineering standards into policy to enhance resiliency is very possible, the timeline outlined for this policy goal does not consider these lengthy bureaucratic processes. Therefore, the timeline of 2024 is unlikely, as it would likely take longer to implement the policy and execution provisions that lead to achieving this policy goal.

ii. Eradicating installation vulnerability of 20% or greater land loss

The aforementioned planning measures attempt to provide a comprehensive risk assessment on mission assurance and fiscal exposure to improve the readiness of installations to increased flooding and encroachment due to sea level rise. However, the cost of protecting infrastructure and military readiness at some installations in the U.S. may not be in the best interest of the Department, particularly for those installations that are within the 100 year floodplain and estimated to experience

⁶⁶ U.S. Department of Defense, *Report on Effects of a Changing Climate to the Department of Defense*, (Washington DC, January 2019), page 10, <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF>

significant land loss and permanent inundation due to location vulnerability. And with the continuous backlog of installation FSRM funding, many installations and their infrastructure have a lifespan that continues to be extended; for instance, the Navy's production shops across four shipyards examined by GAO have an average age of 76 with a substandard condition rate including several deficiencies.⁶⁷ The authorization and subsequent establishment of a new BRAC would eliminate or realign those bases that fit this category. The BRAC process looks across all military bases for cost savings and military value based on a 20-year force structure plan, therefore encapsulating much more than sea level rise criteria. As this policy proposal focuses on adding sea level rise to this criteria, the analysis is also narrowed as the overall installation considerations in BRAC are too expansive to address in this paper.

The last BRAC round, authorized in 2005, was much more costly and expansive than previous BRAC rounds, with implementation costs upwards of \$35 billion from the initially planned implementation costs of \$21 billion.⁶⁸ However, this proposal's \$5 billion cap on implementation costs meaning the Department is limited to only critical installation closures and realignments to account for military value and cost savings. Authorizing this BRAC round would enable the Department to make decisions to directly address the issue of sea level rise and achieve the policy goal of eliminating the most critical vulnerabilities, whether through moving these bases or closing them completely. Instead of ad-hoc emergency supplemental spending and individual installation budget

⁶⁷ Hugh Lessig, "Report: Private Sector beats Navy shipyards on sub repair," *The Daily Press*, September 13, 2018, <https://www.dailypress.com/business/shipyards/dp-nws-cbo-subs-20180913-story.html>.

⁶⁸ Ibid.

requests to address recurring flooding and sea level rise, a BRAC round would ensure unnecessary spending is prevented and strategic adaptation choices are made, thus optimizing the efficiency of this proposal.

State and local governments and their residents benefit economically from military installations. According to one study of the local economic impact of the 2005 round of Base Realignment and Closures, installations serves as local employment hubs, raise regional income levels, and brings military families to the area among other economic stimuli.⁶⁹ Closing these bases due to a variety of reasons can lead to major job losses; while numbers vary greatly, the BRAC study found that Connecticut, for example, experienced a net job loss of over 8,500 positions.⁷⁰ Yet most recurrent savings from past rounds of BRAC are from civilian job cuts, especially the volume of cuts that are the consequence of complete closure.⁷¹

The elimination of the independent commission that assesses the Department's recommendations and administers public hearings on the potential socioeconomic impact of closing a military base would expedite the decision-making process, which has about six months, including four months of deliberations based on previous BRAC rounds.⁷² This, however would lead to a BRAC assessment based on military value and DoD cost savings without input from local stakeholders on the second and third order

⁶⁹ Jim Lee, "BRAC's Impact on Regional Economies," *Corpus Christi and Coastal Bend Economic Pulse* (Corpus Christi, TX, 2014), http://stedc.tamucc.edu/files/Econ_Pulse_2014_2.pdf.

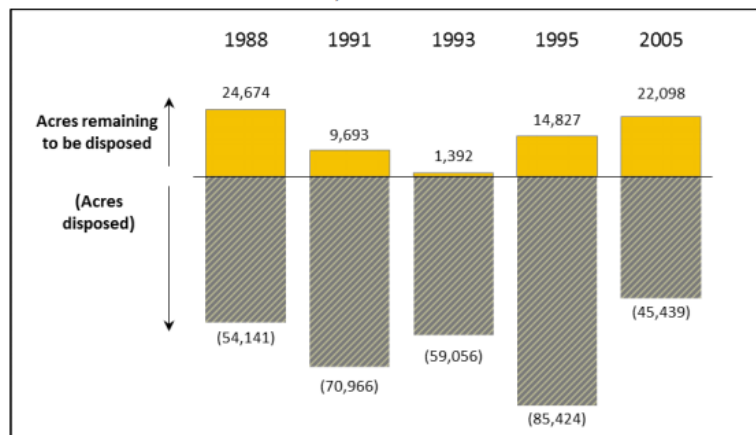
⁷⁰ Ibid.

⁷¹ John Conger, "An Overview of the DOD Installations Enterprise." Military Strength Topical Essays, *The Heritage Foundation*, last modified October 30, 2018, <https://www.heritage.org/military-strength-topical-essays/2019-essays/overview-the-dod-installations-enterprise>.

⁷² Congressional Research Service, "Base Realignment and Closure (BRAC): Background and Issues for Congress." *CRS Report R45705*, last modified April 25, 2019, <https://fas.org/sgp/crs/natsec/R45705.pdf>.

effects of base closure. These civilian effects are significant economic factors, and a lack of civilian participation in the process is a point of considerable issues regarding equity.

Despite the expedited decision-making process for this proposed BRAC round, it would likely not fulfill the established timeline for completion. Previous rounds of BRAC have demonstrated that the transfer and disposal of DOD real property is complex and often does not fit in the six-year implementation window within statute. Figure 4 shows the acreage that remains to be disposed from previous BRAC rounds.



Source: FY2017 data provided to CRS by the DOD Office of Economic Adjustment (OEA), May 2017.

Figure 4. BRAC Acreage Disposed of and Not Yet Disposed ⁷³

Leaving property remaining to be disposed for future decades could cause significant environmental damage if environmental cleanup requirements are not fulfilled prior to flooding or inundation. The 2030 completion timeline would also be delayed if included in the FY20 NDAA due to the 2024 completion timeline for the development of a DoD climate projection tool and 100% installation risk assessment of this policy.

⁷³ Congressional Research Service, "Base Realignment and Closure (BRAC): Background and Issues for Congress." *CRS Report R45705*, last modified April 25, 2019, <https://fas.org/sgp/crs/natsec/R45705.pdf>.

While each installation would have to be individually assessed as to the exact costs of improving this resiliency, it is likely to be very costly, especially for those most vulnerable. Nevertheless, the installations chosen to not be closed during the BRAC round would likely require adaptation measures. The cost of resiliency would be much less expensive than the costs of installation infrastructure repair or replacement after flooding or recurring inundation. In the Department of the Navy's report *FY20 Justification of Budget Estimates*, the Navy requests \$48.9 million for dry dock flood protection improvements including a floodwall and other measures at Naval Support Station Norfolk, the largest naval station in the world.⁷⁴ While noting that significant flooding will increase over time, the Navy's budget request justification states, "Making safe a nuclear submarine overhauled in a dry dock from potential flooding due to approaching storms is a costly procedure which significantly impacts shipyard operations. Significant damage to the inside of a nuclear submarine could reach \$100 million to \$400 million dollars to repair if flooded [...] Additionally, flood damage to the dry dock structure or its support utilities and facilities could substantially impact the ability to restore repair operations..."⁷⁵ While this request cites "impending storms" as the cause for flooding, it also states it is within the 100-year floodplain and, "the risk of significant flooding [...] will continue to increase over the years."⁷⁶ This budget request states that leaving the dry dock vulnerable to rising sea levels leaves critical

⁷⁴ U.S. Department of the Navy, *FY 2020 Budget Estimates, Justification of Estimates for Military Construction Active Force (MCON) and Family Housing*, March 2019, page 213-216, https://climateandsecurity.files.wordpress.com/2019/06/navy-mcon_book_2019_03.pdf

⁷⁵ Ibid.

⁷⁶ Ibid.

infrastructure vulnerable to damage at an exponentially higher cost than the preventative measure.

This case demonstrates that although these resiliency costs will likely require a significant increase in budget authority to address sea level rise and associated recurring or permanent flooding, the costs of not making these modifications have the potential to incur unacceptable costs to the Department. Based on this case, the \$48.9 million cost of sea level rise resiliency versus \$100-400 million repair and replacement costs is on a ratio of 1:2 to 1:10. A report by the Union of Concerned Scientists note that 128 coastal installations in the U.S. would be threatened by a 3-foot increase in sea level. Out of these 128, 43% are naval installations valued at \$100 billion.⁷⁷ Expanding these cost ratios to all coastal installations in the U.S. and its territories, the expense of flood resiliency is immensely less than taking no preventative measures. The Department of Defense has a strong fiduciary responsibility to the American taxpayer, and has every interest in optimizing its own buying power to ensure no funds are taken away from its primary missions to pay the consequence of significant damage or total inundation of these installations. Therefore, proper planning and budgeting to implement these preventative sea level rise resiliency measures is beneficial for all despite the significant costs.

Addressing off-base civilian infrastructure vulnerabilities requires integrated planning of DoD with state and local governments to ensure all external factors are

⁷⁷ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 1, <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>.

accounted for in resiliency plans. The cost-sharing mechanism between the Department of Defense and state and local governments for resiliency projects in this policy does serve as a partial solution to incorporating civilian infrastructure into DoD efforts while ensuring resiliency efforts are not duplicated. Additionally, the cost-sharing allows for a win-win for both parties which share the strong mutual interest of protecting main roads and infrastructure the installation and the surrounding community mutually depend on. Additionally, many vulnerable coastal installations such as Hunter Air Force Base (AFB), Langley AFB, Bolling AFB, Washington Navy Yard, MCRD Parris Island, and Naval Station Norfolk surround communities with high percentages of black and Latino residents and high poverty rates.⁷⁸ These types of communities are more vulnerable to the effects of climate stressors such as flooding events due to poor housing quality, community isolation, and cultural barriers.⁷⁹ While land loss and structural damage to installations themselves account for billions of dollars of replacement costs, the regional economic harm only adds to the costs associated with sea level rise for coastal installations.

This cost sharing carries the additional and obvious benefit of enhancing affordability of preventative resiliency projects for off-base critical civilian infrastructure. Nevertheless, already-strained state and local government budgets may not be able to afford their required percentage of resiliency costs unless revenue-raising

⁷⁸ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 7, <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>.

⁷⁹ Ibid.

mechanisms are adjusted, such as higher taxes for local residents. The federal government would likely have to subsidize some of the infrastructure projects if they are of national security concern. This provision is already in the aforementioned Defense Community Infrastructure Program (DCIP) but if the Department made a sweeping effort to improve installation resiliency as prescribed in this policy, this federal funding would have to be included in the federal budget.⁸⁰ Yet the Department also has limited resources available for resiliency modifications to installations, and will have to prioritize the installations requiring resources to protect against sea-level rise based on the DoD Mission Assurance governance of assessing risks to critical infrastructure. This poses an equity issue with the surrounding cities and towns of installations, as some local governments will be protected and not others. Moreover, some communities surrounding installations will be more vulnerable than others to the impacts of sea level rise as aforementioned. However, resource decisions would be based on national security concerns and not economic or human welfare concerns of local authorities, or the actual localities that are most vulnerable to damage from sea level rise to include complete inundation.

Due to the immense costs outlined in this analysis, adding a budget line item for these specific costs could be an effective way of tracking overall costs of DoD climate change resiliency projects. Requesting funds separately from the Facilities, Sustainment, Restoration, and Modernization budget that faces a backlog of over \$116

⁸⁰ Title 10 USC, Chapter 169, Section 2802, Military Base Reuse Studies and Community Planning Assistance.

billion would circumvent this funding barrier.⁸¹ Since these costs would be tracked separately, Congress could be incentivized to fund these specific sea level rise resiliency projects with the knowledge of the long-term costs if these measures are not fully funded. And as aforementioned the overall long-term cost savings deter from sharp budget crises due to the infrastructure damage projected to come if no action is taken.

Yet even though the cost savings is estimated to be significant, this request would annually pull funds from other missions within the DoD base budget. The Department is already undergoing a so-called “night-court,” cutting programs rapidly in preparation for the FY21 budget request to pay for military modernization efforts related to competing with China and Russia.⁸² One SASC staffer said of the Secretary’s initiative, “We’ve been saying a lot of the right things for a long time. The question is whether we can implement the things we say are important. Buying Thing 1 means you have to divest from Thing 2.”⁸³ The same agonizing, long process would have to be applied to spending on base resiliency measures to find funding, choosing between long-term cost savings and other urgent initiatives- proving to be an equity issue as well as a fiscal issue. Separating these costs from the Facilities, Sustainment, Restoration, and Modernization budget does not necessarily create an expedited funding mechanism.

⁸¹ Rick Berger, “All the Ways the US Military’s Infrastructure Crisis is Getting Worse,” *Defense One*, last modified March 27, 2019, <https://www.defenseone.com/ideas/2019/03/us-militarys-infrastructure-crisis-only-getting-worse/155858/>.

⁸² Aaron Mehta and Joe Gould, “Night court comes to the Pentagon,” *Defense News*, last modified August 28, 2019, <https://www.defensenews.com/pentagon/2019/08/28/night-court-comes-to-the-pentagon/>.

⁸³ Ibid.

III. Political Analysis

As the Ranking Member of the SASC Subcommittee on Readiness and Management Support, you would be an excellent representative to propose and advocate for this proposal. There are several advantages and disadvantages to such a sweeping proposal to address the fiscal exposure and reduction of military readiness due to sea level rise on U.S. military installations. Addressing sea level rise is rooted in climate change, a topic of much debate and diverging views of its severity and even existence based on party association. The political climate of discussion the issue is nearly impossible to circumvent when assessing the feasibility of support of policies addressing the impact of climate change from a variety of stakeholders. Additionally, overtime DOD BRAC has become an extremely political issue as it directly affects local communities and economies.

The view of climate change amongst the American public varies greatly based on political ideology. The Department of Defense is funded by taxpayer dollars, and therefore Americans hold a vested interest in the Department's activities as the largest recipient of discretionary funding. As discussed in the history & background section of this paper, the view of climate change has only become more divergent over time between Democrats and Republicans. Democrats increasingly view climate change as an important issue that should be actioned by Congress and the administration while Republican views stay relatively stagnant. Figure 5 demonstrates Democratic views that global climate change should be a top priority for the president and congress grew from

47% in 2008 to 67%, a 20 point increase; Republicans holding the same view slightly grew by 6 points, from 15% to 21%, in the same time period.⁸⁴

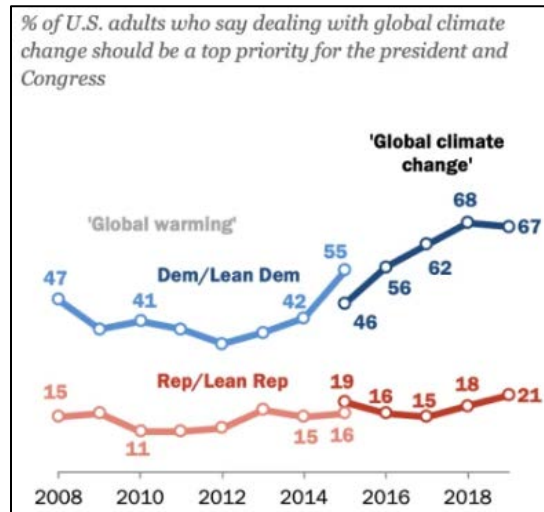


Figure 5. Percentage of Adults Who Say Dealing with Global Climate Change should be a Top Priority for the President and Congress ⁸⁵

These gaps in opinion tend to narrow when focusing on coastal communities and current effects of climate change, many of which have seen damage from “superstorm” hurricanes in the 21st century firsthand and are attuned to the fact that sea level rise will increase vulnerabilities to floods and storm surges. A Pew Research Center 2018 analysis found that 67% of Americans who live within 25 miles of a coastline say that climate change is affecting their local community at least some, compared with 50% of those who live 300 miles or more from the coast.⁸⁶

⁸⁴ Brian Kennedy and Meg Hefferon, “U.S. Concern about Climate Change is Rising, but Mainly Among Democrats,” *Pew Research Center*, last modified August 28, 2019, <https://www.pewresearch.org/fact-tank/2019/08/28/u-s-concern-about-climate-change-is-rising-but-mainly-among-democrats/>.

⁸⁵ Ibid.

⁸⁶ Cary Funk and Brian Kennedy, “How Americans See Climate Change in 5 Charts,” *Pew Research Center*, last modified April 19, 2019, <https://www.pewresearch.org/fact-tank/2019/04/19/how-americans-see-climate-change-in-5-charts/>.

A recent study by the Journal of Science Communications shows, however, that public perception of the threat climate change poses to environmental and national security concerns is highly influenced by the source of climate change messaging, whether concern is expressed by Democratic party leader, a Republican party leader, climate scientists, or U.S. military leaders. After conducting a survey experiment quoting the various sources with concerns on climate change and measuring public reaction, the researchers conclude, “We find that the presence of military leaders as a source of a pro-climate appeal can significantly strengthen its persuasive impact, especially in the case of an appeal emphasizing the effects of climate change on U.S. national security.”⁸⁷ They also concluded the wider claim that when climate concerns endorsed or voiced by military leaders and Republican Party leaders can enhance the impact of the request for climate action.⁸⁸ Therefore in order for the public, especially Republican Americans, to support this policy, military leaders and party leaders will have to openly support this bill and explain its advantages for the American taxpayer.

The Republican Party as a whole have largely neglected the issue of climate change or denied its existence entirely due to actions addressing the issue being, as previously mentioned, in contradiction to conservative ideology. Currently, 150 Republican members of the 116th Congress deny the scientific consensus on climate change, including Senate Armed Services Committee Chairman Jim Inhofe (R-OK).⁸⁹

⁸⁷ Toby Bolsen, Risa Palm, and Justin T. Kingsland, “The Impact of Message Source on the Effectiveness of Communications about Climate Change,” *Journal of Science Communications* (2019), Vol. 41(4), 464-487, <https://journals.sagepub.com/doi/pdf/10.1177/1075547019863154>.

⁸⁸ Ibid.

⁸⁹ Sally Hardin and Claire Moser, “Climate Deniers in the 116th Congress,” *Center for American Progress Action Fund*, last modified January 28, 2019,

Despite long standing scientific consensus on the human activity cause of climate change, and general consensus as to the grave current and future impact of the issue, Republican messaging by members of Congress, conservative think tanks such as the Heritage Foundation, and conservative media have expressed climate change is a hoax or highly exaggerated by the Democratic party. This is largely due to strong lobbying by business leaders, especially those in the fossil fuel industry, to block climate legislation that would harm the operations or revenue of their business.⁹⁰ This has led many conservative Americans to be skeptical of climate change, and likely less willing to support the use of taxpayer dollars on addressing the issue. This messaging also aligns with the Trump administration's notion to deny the issue, and is the reported reason for the elimination of the Navy's Task Force Climate Change with the mission to plan and develop policy discussions on the issue, established in 2009 during the Obama administration.⁹¹ Supporting this sea level rise vulnerability policy would be a statement of fact on the realities of climate change the serious impact it poses on the U.S. military; such statement would contradict historical and current Republican claims about climate change.

On the other hand, this action by the Department would be advantageous for Democrats that have been voicing concerns over these issues for years. Senator Warren as a member of the SASC would ask military leaders within their testimony to, as

<https://www.americanprogressaction.org/issues/green/news/2019/01/28/172944/climate-deniers-116th-congress/>.

⁹⁰ Ibid.

⁹¹ J.D. Simkins, "Navy Quietly ends Climate Change Task Force, Reversing Obama Initiative," *Navy Times*, last modified August 26, 2019, <https://www.navytimes.com/off-duty/military-culture/2019/08/26/navy-quietly-ends-climate-change-task-force-reversing-obama-initiative/>

previously mentioned, publicly acknowledge the potential harm brought to military readiness due to climate change.⁹² This is a democratic attempt to reach across the aisle and provoke a sense of national unity in throwing support behind addressing a common enemy, climate change and sea level rise. Moreover, climate change action implemented by military leaders and gaining support from both Democrat and Republican members would enable Congressional Democrats to make progress on their long-sought climate change agenda, which has been mired by politics. The Democratic climate change agenda is additionally backed by independent Congressional Agencies such as the Government Accountability Office (GAO), which has continued to place on the GAO High Risk List the item of “Limiting the Federal Government’s Fiscal Exposure by Better Managing Climate Risks” due to the requirement for Government transformation and continued lack of administration progress in fulfilling GAO recommendations.⁹³ Other GAO reports previously mentioned have cited the need for better integrating climate change projections into military installation plans and DoD guidance, and this policy would fulfill those recommendations for sea level rise.

In the middle of this political party debate are Department leaders themselves. Military leadership and staff often attest to serving for national defense and attempt to stay out of politics as much as possible. However, as seen from the aforementioned

⁹² Office of Senator Elizabeth Warren, Press Release, “Senator Warren’s SASC Hearing Questions Reveal Unanimity of Military Leaders on Climate Change as a Threat to Readiness,” last modified April 16, 2019, <https://www.warren.senate.gov/newsroom/press-releases/senator-warrens-sasc-hearing-questions-reveal-unanimity-of-military-leaders-on-climate-change-as-a-threat-to-readiness>.

⁹³ U.S. Government Accountability Office, “2019 High Risk List: Limiting the Federal Government’s Fiscal Exposure by Better Managing Climate Change Risks,” *GAO Report GAO-19-157SP*, last modified March 6, 2019, <https://www.gao.gov/products/GAO-19-157sp>.

cancellation of the Navy Climate Change Task Force, pressure from the administration cannot be avoided, and in this case the Commander-in-Chief is a climate change denier. Although administration officials would likely prefer to quietly address these issues due to political controversy over addressing them, many in-office representatives including Service Secretaries, Secretary Jim Mattis, and the Chief Installations Official, Honorable Niemeyer publicly expressed the issues of sea level rise risks to installations in public congressional testimony.⁹⁴ Moreover, retired military officials, no longer expected to remain silent, have proven particularly candid actors about the infrastructure risks to sea level rise. Several retired generals and officials like John Conger, the former Principal Deputy Defense Comptroller, have founded and chaired think tanks on the national security implications of climate change to include organizations like Mr. Congers, The Center for Climate and Security, and others like the American Security Project. These organizations synchronize policy positions on this issue by concerned former military officers concerned. In March 2019, under the suspicion that the White House was considering forming a committee on denying climate science, a position paper signed by 58 former military and national security officials expressed their concern and condemnation of such a committee.⁹⁵ These actors strongly support improving military readiness by addressing sea level rise, and continue to inform

⁹⁴ Francesco Femia & Caitlin Werrell, "UPDATE: Chronology of U.S. Military Statements and Actions on Climate Change and Security," *The Center for Climate and Security*, last modified August 22, 2019, <https://climateandsecurity.org/2019/08/22/update-chronology-of-u-s-military-statements-and-actions-on-climate-change-and-security-jan-2017-august-2019/>.

⁹⁵ Dalia Mortada, "Former Defense Leaders Warn White House It's 'Dangerous' To Downplay Climate Change," *NPR*, last modified March 5, 2019, <https://www.npr.org/2019/03/05/700462955/former-defense-leaders-warn-white-house-its-dangerous-to-downplay-climate-change>

Congressional leaders as subject matter experts and inform the public about the issue via reports, publications, and media releases.

Yet just as the American public converges on the threat of the issue in coastal communities, Republican Party leaders in those areas are increasingly pressured to support climate change action by their constituents. In the state of Florida with some of the largest stretches (1,350 miles) of coastline in the country, GOP leaders like Governor Rick DeSantis, state representative Chris Fowles, and Congressman Matt Gaetz all have spoken out on the issue of climate change and sea level rise despite national Republican leanings. In a recent survey of 3,700 midterm voters in Florida, 46% responded as “very concerned” about climate change.⁹⁶ According to a former political science professor at the University of South Florida, “republicans have figured out that if you get caught crossways on the environment, you could very well lose an election. That’s how important the issue is to Floridians of all stripes.”⁹⁷

This pressure on GOP representatives expands to other southeast coastal states like Georgia and South Carolina, although Florida’s Republican Representative Francis Rooney co-chairs the House Climate Solutions Caucus with a Floridian Democratic counterpart, Rep. Ted Deutch. The caucus, established in 2016, is the only bipartisan Congressional Caucus focused on discussing the issue of climate change and introducing bipartisan legislation. Caucus members include 23 House Republicans and 41 House Democrats, proving the issue has the potential for further bipartisan work. As figure 5

⁹⁶ Bobby Caina Calvan, “In Florida and Elsewhere, GOP Pressured over Climate Change,” *Associated Press*, last modified November 27, 2019, <https://apnews.com/a81c00520bc24257b4f273b0fe1bcc88>.

⁹⁷ Ibid.

shows, DoD coastal installations that have or will be affected by sea level rise spread across various Congressional districts in every coastal state.

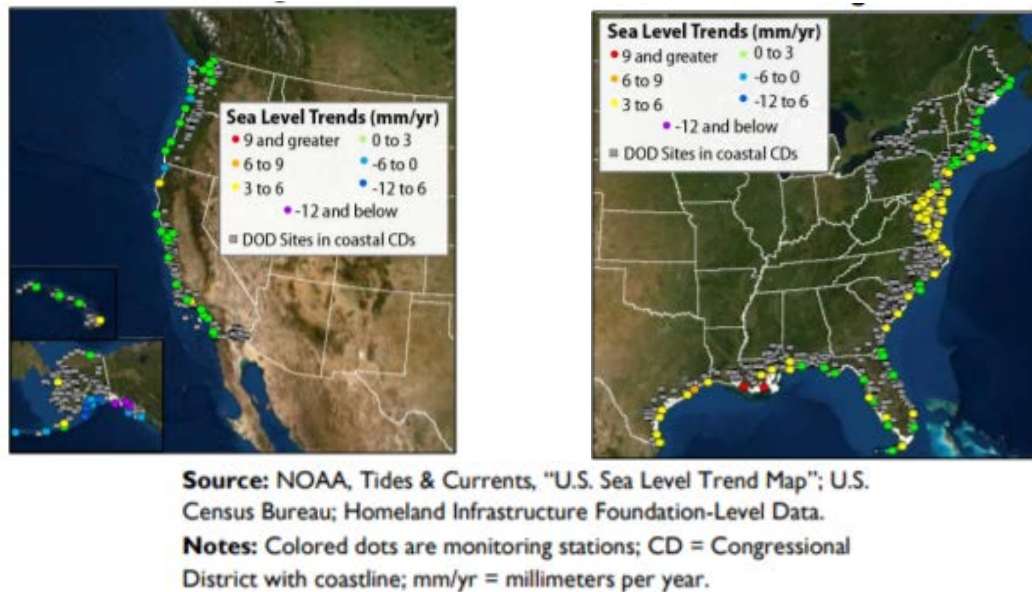


Figure 6. Relative Sea-Level Change Trends & Military Installations in Coastal Congressional Districts⁹⁸

Another part of this policy that is extremely political is the Base Realignment and Closure (BRAC) process. Your subcommittee is the proponent for BRAC oversight. The last BRAC round of 2005 was not received well by Congress, as it was seen as DoD taking advantage of the process to achieve DoD force management objectives over total cost savings.⁹⁹ Moreover, Congressmen experience immense pressure from their constituents to block any measures that would close bases in their district that brings jobs and business to the area. This policy would remove the independent commission from the decision-making process, which was initially built into the process to eliminate

⁹⁸ Margaret Tucker and G. James Herrera, "Military Installations and Sea Level Rise," *Congressional Research Service*, July 26, 2019, <https://fas.org/sgp/crs/natsec/IF11275.pdf>.

⁹⁹ Congressional Research Service, "Base Realignment and Closure (BRAC): Background and Issues for Congress." *CRS Report R45705*, last modified April 25, 2019, <https://fas.org/sgp/crs/natsec/R45705.pdf>.

these political pressures. It would be consistent with previous comments of yours to support the elimination of this commission, as you have stated, “The Pentagon has the province to make recommendations on excess capacity, and voters will hold us accountable” and previously rejected new BRAC rounds due to viewing the independent commission as parochial and unnecessary.¹⁰⁰

This would align with the Department’s recurring request for a new BRAC round, along with the broader defense community. Thirty-eight defense think tank scholars previously wrote a letter the Secretary of Defense and Congressional leaders urging for base closures due to cost savings for the Department and opportunity to reform and downsize its civilian workforce and costly excess infrastructure.¹⁰¹ This defense community includes your SASC colleagues, as former Chairman McCain and Ranking Member Reed introduced the amendment to the FY18 NDAA that this BRAC proposal is based on. This proposal includes the \$5 billion cap on implementation costs, which would resolve BRAC concerns Congress currently has based on the 2005 BRAC round.

Another important feature of this policy is the effect on your own state of Virginia. As seen from Figure 6, Virginia is one of the high-vulnerability states as it is projected to undergo several feet of sea level rise by 2100. Naval Station Norfolk, the largest U.S. naval base in the world, is currently facing severe challenges of sinking elevation, high rates of sea level rise, and recurring flooding that will likely lead to permanent inundation. The economy of Virginia relies on this base to provide

¹⁰⁰ Hugh Lessig, “Pentagon continues push for base-closing authority” *Daily Press*, last modified March 13, 2015, <https://www.dailypress.com/military/dp-ews-brac-debate-20150313-story.html>.

¹⁰¹ Ibid.

thousands of jobs to Virginia residents along with important naval military value; therefore, the base commander along with state and local officials have worked together to address the issue through a comprehensive independent assessment and ongoing maintenance and construction efforts. As Figure 7 shows, over 50% of residents in all Congressional Districts of Virginia believe Congress should do more to address global warming, with that number generally increasing as the District is closer to the shoreline.

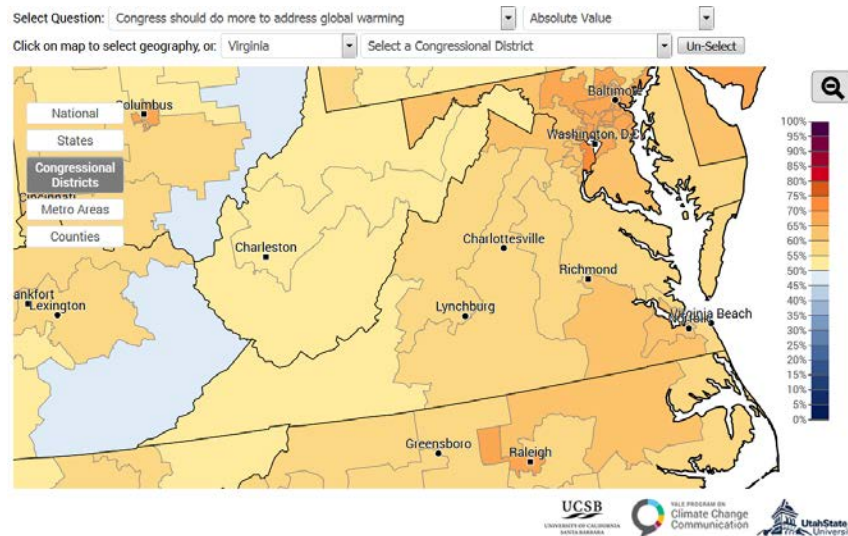


Figure 7. Virginia Constituents on Whether Congress Should Do More to Address Climate Change¹⁰²

The majority of residents of Virginia would likely support this policy as it confronts issues they are concerned about head-on. The region of Hampton Roads, which includes Naval Station Norfolk, is one of the most advanced installations in terms of addressing sea-level rise and conducting an expansive assessment of possible actions.

¹⁰² Jennifer Marlon and Peter Howe, “Yale Climate Opinion Maps 2019,” Program on Climate Change Communication, *Yale University*, last modified on September 17, 2019, <https://climatecommunication.yale.edu/visualizations-data/ycom-us/>.

Therefore, the requirements in this policy to adopt a DoD sea level rise assessment tool would be redundant for current utilization, although it could save the cost of independent assessments in the future. Despite this inconvenience, specifically funding the Defense Community Infrastructure Program at \$100 million, which was originally proposed by your Congressional Virginia counterpart, Representative Elaine G. Luria (2nd District, Virginia) is expected to be supported by the 2nd District and the state as a whole. Supporting this bill would be consistent with your past record calling for DoD action on the issue and expressing concern. In a SASC hearing on extreme weather impacts on DoD installations, you noted, “We had a very well attended hearing in Hampton Roads now nearly 2 years ago, very bipartisan Congressional delegation talking about sea level rise and the effect on Norfolk and other bases, Langley and others in the area. And it was pretty sobering, and we started thinking about, if there’s a future BRAC round or any kind of, you know, physical base rationalization, that’s got to be a vulnerability that people would be concerned about.”¹⁰³

Residents in Hampton Roads as well as their Congressional representatives have recently raised concerns on the possibility of a new BRAC due to the economy’s dependence on bases. For example, military spending accounted for 42 percent of the region’s gross domestic product in 2017.¹⁰⁴ Nevertheless, your state has led much of

¹⁰³ Francesco Femia & Caitlin Werrell, “UPDATE: Chronology of U.S. Military Statements and Actions on Climate Change and Security,” *The Center for Climate and Security*, last modified August 22, 2019, <https://climateandsecurity.org/2019/08/22/update-chronology-of-u-s-military-statements-and-actions-on-climate-change-and-security-jan-2017-august-2019/>.

¹⁰⁴ Kimberly Pierceall, “The future of Hampton Roads: We’ve finally recovered, but when will BRAC hit us again?” *The Virginian-Pilot*, last modified October 2, 2018, https://www.pilotonline.com/business/shipyards/article_585b20f4-c357-11e8-995d-7fb3f47439f7.html.

the efforts to proactively address sea level rise vulnerabilities, as the community and the installation leadership have joined together to produce a comprehensive vulnerability assessment with coordination by the Hampton Roads Military and Federal Facilities Alliance. When asked about the possibility of a new BRAC round, the Executive Director of this Alliance stated, “We don’t wait for Congress to approve a BRAC before getting at [...] issues; we get at them as soon as they’re identified. By dealing with them in the moment, we are as prepared as possible if Congress approves another round [...]. We want the conditions surrounding our military installations to be so good that the Defense Department would move additional forces here from other areas.”¹⁰⁵

IV. Recommendation

Although significant political divide impedes Congressional legislation attempting to address the impact of climate change, supporting the *Rising Tides Defense Resiliency and Readiness Act* would be politically beneficial to you and addresses tangible challenges of your constituents. This proposal is aligned with the stated values of the residents of Virginia and you as their representative in terms of addressing climate change resiliency, supporting our national security and military, and supporting a new BRAC round that puts responsibility directly with DoD and Congress. Your state of Virginia is one of the most vulnerable states to sea level rise inundation, specifically the Hampton Roads area that holds over 16 military bases, including the largest naval base in the world. Making every effort to address these challenges at the federal level

¹⁰⁵ Craig Quigley, “Letter: We don’t wait for BRAC,” *The Virginian-Pilot*, last modified October 7, 2018, https://www.pilotonline.com/opinion/letters/article_f5d7fc24-c818-11e8-9bee-efaa28183b9a.html.

directly benefits the bases and surrounding communities in Virginia. The Defense Infrastructure Program was championed by your Virginian colleague, Representative Luria, and would directly assist the already significant measures that have been implemented by the Hampton Roads installations and surrounding communities.

The overall goals of this policy are to complete sea level rise vulnerability assessments for 100% of military installations in the United States and its territories and that zero assessed installations, by 2030, will have land loss of 20% or greater projected for year 2050. Although this policy will required large upfront costs from the Defense Department's base budget, the long-term cost savings make these actions necessary. Addressing the immense financial implications of after-the-fact installation repair and replacement is estimated to cost well over \$100 billion over the coming decades.¹⁰⁶ Long-term planning efforts toward increasing sea level rise resiliency is more effective than the current state of reactionary and inconsistent efforts by Congress and the Department. This planning provides the mechanism authorizing Congressional appropriators to distribute adaptation costs year over year in the annual budget cycle instead of supporting DoD supplemental funding requests for infrastructure repair and replacement. This ultimately saves dollars for the Department, preventing the diversion of funds to installation repair and replacement that ultimately harm the ability to support military missions.

¹⁰⁶ The Union of Concerned Scientists, *Executive Summary: The U.S. Military on the Front Lines of Rising Seas* (July 27, 2016), 1, <https://www.ucsusa.org/global-warming/science-and-impacts/impacts/sea-level-rise-flooding-us-military-bases>.

The successful completion of the stated policy goals is reasonably possible through the outlined mechanism, despite likely not being implemented by the 2030 timeline. This policy will enable the use of vetted climate projections across small, intermediate, and major fixed installations will ensure the accurate identification of those installations with the most mission-critical need of resiliency modifications for long-term planning and budgeting prioritization. A BRAC round would serve as a comprehensive mechanism to address fixed installations where modifications would be too costly or impractical while funding adaption projects for the rest of the Department's overall high-risk real estate portfolio.

If DoD fully implements the provisions of the policy, the issue of sea level rise for coastal areas will, of course, not go away. However, these five-fold measures could reduce the operational and fiscal risk of significant damage or total inundation of some coastal installations. You as a member of Congress have an opportunity to reform U.S. climate policy with this DoD initiative. With successful implementation of this policy, the Department will have installations that are able to support national security efforts for the next century. Setting forth the process for the Defense Department to address sea level rise as an issue of military readiness and fiscal exposure will save taxpayer dollars and allow the Department to focus efforts on urgent national security issues.

CURRICULUM VITAE

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